

**BEFORE THE
ALABAMA PUBLIC SERVICE COMMISSION**

RE:	In the Matter of Implementation of)	
	The FCC's Triennial Review Order)	Docket No. 29054
	<i>(Phase II – Local Switching for Mass</i>)	
	<i>Market Customers)</i>)	Filed: January 20, 2004
)	

DIRECT TESTIMONY OF JAY M. BRADBURY

ON BEHALF OF

AT&T COMMUNICATIONS OF THE SOUTH CENTRAL STATES, LLC

1 **I. WITNESS QUALIFICATION AND INTRODUCTION**

2 **Q. PLEASE STATE YOUR NAME, BUSINESS ADDRESS AND POSITION**
3 **TITLE.**

4 A. My name is Jay M. Bradbury. My business address is 1200 Peachtree Street, Suite
5 8100, Atlanta, Georgia 30309. I am employed by AT&T Corp. (“AT&T”) as a
6 District Manager in the Law and Government Affairs Organization.

7 **Q. PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND AND WORK**
8 **EXPERIENCE IN THE TELECOMMUNICATIONS INDUSTRY.**

9 A. I graduated with a Bachelor of Arts degree from The Citadel in 1966. I have taken
10 additional undergraduate and graduate courses at the University of South Carolina
11 and North Carolina State University in Business and Economics. I earned a Masters
12 Certificate in Project Management from the Stevens Institute of Technology in 2000.

13 I have been employed in the telecommunications industry for more than thirty-three
14 years with AT&T, including fourteen (14) years with AT&T’s then-subsiidiary,
15 Southern Bell. I began my AT&T career in 1970 as a Chief Operator with Southern
16 Bell’s Operator Services Department in Raleigh, North Carolina. From 1972 through
17 1987, I held various positions within Southern Bell’s (1972 – 1984) and AT&T’s
18 (1984 – 1987) Operator Services Departments, where I was responsible for the
19 planning, engineering, implementation and administration of personnel, processes and
20 network equipment used to provide local and toll operator services and directory

1 assistance services in North Carolina, South Carolina, Kentucky, Tennessee and
2 Mississippi. In 1987, I transferred to AT&T's External Affairs Department in
3 Atlanta, Georgia, where I was responsible for managing AT&T's needs for access
4 network interfaces with South Central Bell, including the resolution of operational
5 performance, financial and policy issues.

6 From 1989 through November 1992, I was responsible for AT&T's relationships and
7 contract negotiations with independent telephone companies within the South Central
8 Bell States and Florida. From November 1992 through April 1993, I was a
9 Regulatory Affairs Manager in the Law and Government Affairs Division. In that
10 position, I was responsible for the analysis of industry proposals before regulatory
11 bodies in the South Central states to determine their impact on AT&T's ability to
12 meet its customers' needs with services that are competitively priced and profitable.
13 In April 1993, I transferred to the Access Management Organization within AT&T's
14 Network Services Division as a Manager – Access Provisioning and Maintenance,
15 with responsibility for ongoing management of processes and structures in place with
16 Southwestern Bell to assure that its access provisioning and maintenance performance
17 met the needs of AT&T's strategic business units.

18 In August 1995, as a Manager in the Local Infrastructure and Access Management
19 Organization, I became responsible for negotiating and implementing operational
20 agreements with incumbent local exchange carriers needed to support AT&T's entry
21 into the local telecommunications market. I was transferred to the Law and

1 Government Affairs Organization in June 1998, with the same responsibilities. One
2 of my most important objectives was to ensure that BellSouth provided AT&T with
3 efficient and nondiscriminatory access to BellSouth's Operations Support Systems
4 (OSS) throughout BellSouth's nine-state region to support AT&T's market entry.

5 Beginning in 2002 my activities expanded to provide continuing advice to AT&T
6 decision makers concerning industry-wide OSS, network, and operations policy,
7 implementation, and performance impacts to AT&T's business plans.

8 **Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE REGULATORY**
9 **COMMISSIONS?**

10 A. Yes, I have testified on behalf of AT&T in numerous state public utility commission
11 proceedings regarding various network and related issues, including arbitrations,
12 performance measures proceedings, Section 271 proceedings, and quality of service
13 proceedings, in all nine states in the BellSouth region. I also have testified on behalf
14 of AT&T in proceedings before the FCC regarding BellSouth's applications to
15 provide in-region interLATA long distance service.

16 **Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?**

17 A. The critical issue of this proceeding is not whether CLECs can "deploy" their own
18 switches. Instead, the critical issue upon which this Commission should focus is
19 whether a CLEC can "efficiently use" its own switch to connect to the local loops of
20 end users. The differences in the way end users' loops are connected to carriers'

1 switches are among the most important factors that cause CLECs to face substantial
2 operational and economic entry barriers when they seek to offer Plain Old Telephone
3 Service (“POTS”) to mass-market (residential and small business) customers using
4 their own switches and ILEC-provided loops (i.e., *via* unbundled network element-
5 loop or “UNE-L” facilities-based entry). Until these barriers are removed, the FCC’s
6 finding of impairment cannot be overturned.

7 Accordingly my testimony:

- 8 • Compares the significantly different network architectures available to an ILEC
9 and a CLEC when each wishes to use an ILEC-owned analog voice-grade loop,
10 also referred to as a DSO loop, to connect a mass market customer with its
11 respective switch in order to provide POTS; and
- 12 • Provides an overview of the network architecturally-based operational and
13 economic entry barriers to successful UNE-L facilities-based entry and identifies
14 CLEC witnesses who will provide more detailed testimony on the impact of those
15 barriers and the fact that until the underlying local network architecture that has
16 created these barriers is changed, CLECs will continue to face significant
17 practical and economic impairments.

18 **Q. DID THE FCC MAKE ANY FINDINGS IN THE TRIENNIAL REVIEW**
19 **ORDER (“TRO”) REGARDING THE ISSUES YOU DISCUSS?**

1 A. Yes. The FCC found on a national basis that CLECs are impaired in serving the mass
2 market in the absence of unbundled ILEC switching.¹ This finding was based on an
3 analysis that began with the simple, self-evident proposition that CLECs cannot use
4 their own switches, in lieu of the ILECs', unless they can connect their switches to
5 their end-users' loops. The FCC explained:

6 Competitive LECs can use their own switches to provide services only
7 by gaining access to customers' loop facilities, which predominately,
8 if not exclusively, are provided by the incumbent LEC. Although the
9 record indicates that competitors can deploy duplicate switches
10 capable of serving all customer classes, without the ability to combine
11 those switches with customers' loops in an economic manner,
12 competitors remain impaired in their ability to provide service.
13 Accordingly, it is critical to consider competing carriers' ability to
14 have customers' loops connected to their switches in a reasonable and
15 timely manner.² (Emphasis added.)

16 To emphasize the importance of the ability of CLECs to connect their switches to the
17 loops of their end-users, the FCC noted that no party disputed that competitors need
18 access to the ILECs' loops to compete in the mass market.³

19 Starting from its basic premise that an economic connection between the local loop
20 and a CLEC switch is a condition of non-impairment, the FCC noted the evidence in
21 its record indicating the large disparity between the cost that CLECs incur to connect
22 their end-users' loops to their own switches and the significantly lower cost that the
23 ILECs incur to do the same thing.⁴ The evidence demonstrated that "even using the
24 most efficient network architecture available for entry using the UNE-L strategy,

¹ TRO at ¶¶ 422, 459.

² TRO at ¶ 429 (emphasis added).

³ TRO at n. 1316.

⁴ TRO, at ¶¶ 479-481.

1 [CLECs] are at a significant cost disadvantage vis-à-vis the incumbent in all areas.”⁵
2 The FCC relied on evidence of the CLECs’ “cost of backhauling the voice circuit to
3 their switch from the customer’s end office” where his/her loop terminates, and noted
4 that a significant cost disparity is created because the ILEC, whose switches are
5 located where the customers’ loops end, does not experience such costs.⁶

6 Indeed, the FCC was very specific about evidence of the additional costs faced by the
7 CLECs. That CLECs must backhaul the circuit to their switches, *i.e.*, to extend the
8 customer’s loop beyond the point where it had connected to the ILECs switch, gives
9 rise to “costs of collocating in the customer’s serving wire center, installing
10 equipment in the wire center in order to digitize, aggregate, and transmit the voice
11 traffic, and paying the incumbent to transport the traffic to the competitor’s switch,”
12 all costs that “put [CLECs] at a significant cost disadvantage to the incumbent.”⁷

13 **Q HOW DO THESE DIFFERENCES IMPACT THE ABILITY OF CLECS TO**
14 **SERVE CONSUMERS USING UNE-L GENERALLY OR FROM EXISTING**
15 **ENTERPRISE SWITCHES IN PARTICULAR?**

16 **A.** The difference in the way that ILECs and CLECs connect to the ILEC loops serving
17 end-users lies at the heart of the impairment that CLECs sustain in trying to serve
18 mass market customers without access to unbundled switching and unbundled

⁵ TRO at ¶ 479.

⁶ *Id.*, at ¶ 479.

⁷ *Id.*, at ¶ 480 (citations omitted).

1 network element-platform (“UNE-P”). The ILECs’ advantage in the way they
2 connect their switches to the loops of their end user customers derives from their
3 historic monopoly position. The CLECs cannot replicate the advantages resulting
4 from the ILEC’s legacy network.

5 The difference in the manner and cost of connecting loops to switches between ILECs
6 and CLECs affects mass market customers, the consumers expecting to benefit from
7 competition, in particular. The significant cost of the CLEC having to backhaul the
8 loop, even after that cost is spread across all mass market customers that a CLEC can
9 possibly serve, cannot be overcome by a CLEC being smarter or more agile in the
10 market or by cutting corners on internal costs. It simply is too large.

11 Indeed, as demonstrated in the testimony of Steven E. Turner, the cost of the
12 backhaul structure that CLECs must incur and that ILECs do not incur amounts to
13 more than the total ILEC TELRIC cost of providing switching in order to serve the
14 customer. That is why it is less expensive for CLECs to pay ILECs for the cost of
15 unbundled switching, instead of using capacity on their own switches currently
16 serving enterprise customers, even when the capacity is currently spare. Indeed, so
17 great are the backhaul costs per mass market customer that CLECs could not compete
18 with ILECs if forced to backhaul their mass market voice circuits to their enterprise
19 switches, even if there is spare capacity on those switches. That is why the
20 Commission cannot rely on the presence of switches used to serve enterprise

1 customers in an area as probative of whether CLECs can serve mass market
2 customers without access to mass market switching.

3 The FCC found the failure of CLECs to utilize their existing enterprise switches to be
4 probative evidence of significant barriers making entry uneconomic.

5 We found significantly more probative the evidence that in areas where
6 competitors have their own switches for other purposes (e.g., enterprise
7 switches), they are not converting them to serve mass market customers and
8 instead relying on unbundled loops combined with unbundled local circuit
9 switching. Given the fixed costs already invested in these switches,
10 competitors have every incentive to spread the costs over a broader base.
11 Their failure to do so bolsters our finding that significant barriers caused by
12 hot cuts and other factors make such entry uneconomic.⁸

13
14 We find . . . that the fact that competitors have not converted unbundled loops
15 combined with unbundled local switching or served residential customers with
16 existing switches only serves to demonstrate the barriers to such service.⁹

17 **Q. FROM A NETWORK ARCHITECTURE PERSPECTIVE WHAT IS THE**
18 **FUNDAMENTAL OR CENTRAL PROBLEM UNDERLYING THE FCC'S**
19 **FINDING OF IMPAIRMENT?**

20 **A.** As discussed in detail below, the central problem is that the ILECs' legacy network
21 architecture was designed to support a single regulated monopoly provider, not a
22 competitive market with multiple service providers seeking access to the ILEC's
23 loops. This architecture allows an ILEC to efficiently connect its legacy loops to its
24 own switches within the ILEC's wire center to provide service to end user customers.
25 However, the legacy ILEC network architecture provides an inefficient and

⁸ TRO, at ¶ 447, fn.1365

⁹ TRO, at ¶ 449, fn.1371 (citations omitted)

1 uneconomic means for a CLEC that tries to connect those same loops to its switch
2 that is always remotely located from the ILEC central office where these loops
3 terminate. This fundamental structural difference creates overwhelming operational
4 and economic advantages for the ILEC, advantages that make it both impractical and
5 uneconomic for CLEC competitors to compete with the ILEC to serve mass market
6 customers using an UNE-L architecture.

7 **Q. WHAT ARE THE KEY COMPONENTS OF THIS STRUCTURAL**
8 **DISADVANTAGE?**

9 A. There are four key components to this structural disadvantage.

10 First, a CLEC must incur the time and cost to install and maintain a significant
11 “backhaul” network infrastructure to connect its switch to the ILEC loops that
12 terminate in the ILEC’s wire center, which may also be referred to as a central office
13 (“CO”) or local serving office (“LSO”), while the ILEC has no such need for
14 backhaul facilities. As the FCC explained in the TRO, “The need to backhaul the
15 circuit derives from the use of a switch located in a location relatively far from the
16 end user’s premises, which effectively requires competitors to deploy much longer
17 loops than the incumbent”.¹⁰ These CLEC backhaul costs include the non-recurring
18 costs necessary to establish a collocation arrangement in every ILEC wire center in
19 which the CLEC wishes to offer mass market services, the recurring costs paid to the
20 ILEC for maintaining these collocation arrangements as well as the transport

¹⁰ TRO at ¶ 480 (citations omitted); see also TRO at ¶ 464, n. 1406, TRO, at ¶ 424, n. 1298, and TRO at ¶ 429.

1 equipment and facilities necessary to extend the ILEC's loops to the remotely located
2 CLEC switch.

3 Second, as the FCC found, a UNE-L CLEC must aggregate traffic from many
4 locations in order to achieve the same switch economies of scale realized by an ILEC
5 at a single location. This forces the CLEC to incur its backhaul cost disadvantage in
6 many wire centers in order to achieve the type of switch scale economies that the
7 ILEC achieves at a single wire center.

8 Third, the CLEC must pay exorbitant charges to the ILEC for transferring loops from
9 the ILEC switch to a CLEC collocation facility, or from one CLEC to another. This
10 transfer process also forces the CLEC's customers to suffer an inferior experience in
11 converting to the CLEC's service compared with the treatment they can receive using
12 UNE-P, or that interexchange carriers -- including the ILECs -- can offer customers
13 using the Primary Interexchange Carrier ("PIC") change process for allowing
14 customers to change their long distance service provider.

15 Finally, the CLEC is precluded from serving an entire segment of retail customers,
16 those whose loops are currently served by integrated digital loop carrier (IDLC)
17 systems, unless the ILEC has the spare non-IDLC loop plant in place to replace these
18 customer's lines so that they are eligible for a UNE-L migration to a CLEC. This is
19 described in more detail in Section V.

1 Because these significant economic and operational barriers are rooted in the ILECs’
2 network design, a UNE-L market entry strategy to serve the mass market cannot be
3 sustained unless there are significant modifications to the ILECs’ existing network
4 architecture.

5 **Q. PLEASE DESCRIBE HOW THE REMAINDER OF YOUR TESTIMONY IS**
6 **ORGANIZED.**

7 A. Section II provides a historical overview of how the ILECs’ networks developed and
8 the principles underlying their evolution in a monopoly environment.

9 Section III describes how end-user locations are connected to ILEC switches and why
10 that service configuration has serious implications for mass-market competition.

11 Section IV describes CLEC networks and how the incumbents’ closed and integrated
12 network architecture causes quantifiable and significant cost disadvantages for a new
13 entrant.

14 Section V briefly describes the impairment created by the ILECs’ increasing
15 deployment of integrated digital loop carrier (“IDLC”) technology and the
16 impairment resulting from differences in call termination capabilities.

17 Section VI provides my concluding thoughts.

1 **II. PRINCIPLES UNDERLYING THE HISTORICAL DEVELOPMENT OF**
2 **ILEC NETWORKS**

3 **Q. CAN YOU PROVIDE AN OVERVIEW OF THE PRINCIPLES**
4 **UNDERLYING THE HISTORICAL DEVELOPMENT OF ILEC**
5 **NETWORKS?**

6 **A.** Yes. The essence of the telephone network is *connecting* one party to another,
7 whether they are physically located near each other or separated by considerable
8 distance. There is value in merely being *able* to call any party on the network, or
9 likewise being *able* to receive calls from any party on the network. In theory, the
10 more parties that can be reached, the greater the value of the network. The nature of
11 voice communication is that even brief conversations, such as emergency calls, can
12 be of great value. Telephone networks are predominantly designed to facilitate
13 relatively short, private, one-to-one, bilateral communications. The telephone
14 network must stand ready to complete any particular call (or tens of millions of calls)
15 at any time customers want to call, but stand partly idle when customers do not wish
16 to use it.

17 Because of the high fixed cost required to maintain the ability to make direct
18 connections between all customers and the relatively small proportion of time that
19 those connections are required (coupled with the practical impossibility of directly
20 connecting every customer to every other customer), the goal of an efficient
21 telephone network is to balance the callers' ability to connect to any other customer
22 with the cost of making the connection. This is accomplished by minimizing the

1 proportion of assets dedicated to any particular customer and by creating “on-
2 demand” connections whenever practical.

3 **Q. HOW IS THE NEED FOR DEDICATED CONNECTIONS TO SERVE**
4 **CUSTOMERS REDUCED?**

5 **A.** Switching reduces the need for dedicated connections. In fact, a single switch in the
6 ILEC’s network permits any customer terminated on that switch to connect with any
7 other customer terminating on that same switch without the need for any transport
8 facilities. Depending on population density, these “intra-switch” calls can account for
9 a very large percentage of all of the ILEC’s traffic. By connecting switches to each
10 other using efficient transport and tandem switching, all customers on those switches
11 can connect with each other.

12 For example, assume that we wish to interconnect eight different customers for a two-
13 way conversation between any two of the customers. (See Exhibit JMB- 1) If we
14 count all of the transmission paths between any two of the eight customers, we find
15 that a total of 28 such paths are required.

16 The maximum number of simultaneous connections that may exist, obviously, is four
17 -- half of the subscribers talking to the other half. Furthermore, if a traffic study were
18 made over a period of time, it would probably show that the occasions on which more
19 than two links were in use would be quite rare. Clearly, maintaining 28 dedicated
20 transmission paths is an inefficient arrangement.

1 Taking this example a step further, assume instead we have 1,000 customers that we
2 wish to connect. It would be impossible to lay out the required 499,500 dedicated
3 transmission paths necessary to allow these customers to communicate with each
4 other. Thus, the central office was established as a point where all the transmission
5 paths to the individual customers were terminated for switching. The original
6 switches in these central offices were manual switchboards. All of today's switches
7 are, of course, fully automated.

8 **Q. BECAUSE A SINGLE SWITCH OBVIOUSLY CANNOT BE USED TO**
9 **SERVE ALL CUSTOMERS, HOW DID THE INDUSTRY RESOLVE THIS**
10 **PROBLEM?**

11 **A.** Once central offices were established, two more questions rapidly came upon the
12 industry: how many switches are needed to serve a given geographic area and how to
13 connect customers in one switch to those in another?

14 The decision to invest in more switches was an economic trade off among: (1) the
15 cost of an additional switch in a territory, (2) the cost of building long customer
16 loops, or (3) deciding not to provide service, avoid the cost, and forego the additional
17 revenue.

18 A typical copper loop without any enhancement can provide adequate telephone
19 service out to a distance of about 18,000 feet (3.4 miles) from a switch. Thus in the
20 early days of the industry, there were a lot of areas and customers without telephone

1 service. Over time loop design and enhancement capabilities improved, making it
2 possible, at a cost, to provide telephone service up to 160,000 feet (30.3 miles) from a
3 switch, although such costly extreme loop lengths are rare. For decades, telephone
4 companies extended service, grew and added switches by comparing the economics
5 of long loops versus additional switches. In urbanized areas, bigger switches became
6 located closer to the customers they served. In rural areas, with lower population
7 densities, smaller switches with longer average loop lengths are more common.

8 Connecting all individual switches to each other with dedicated facilities may at first
9 seem to create the same problem discussed above caused by connecting end-users
10 with dedicated facilities; however, the connections between switches, known as
11 “trunks” and “trunk groups” are much more efficient than loops. Loops are dedicated
12 to individual customers; trunks, however, are used by multiple customers on an as
13 needed basis. As a result, a key characteristic of trunks is that they carry
14 “concentrated” traffic. Concentration, or over-subscription, is possible because it is
15 unlikely that all potential users will want to make calls simultaneously. This permits
16 the sharing of facilities by more users than could be accommodated if all users sought
17 service at the same time. Concentration is limited by the level of service blockage
18 probability that is deemed acceptable.

19 Trunk facilities are also less costly than individual loop facilities because trunks can
20 be “multiplexed” – several trunks can be placed on the same facility. Multiplexing is
21 the encoding and compacting of communications so that they take up less “space” on
22 a communication facility. No blocking is introduced by multiplexing, although the

1 degree to which the communications are compressed and the sophistication of the
2 encoding may affect the ultimate service quality.

3 Further, “switching between switches”, known as “tandem switching.” can also be
4 used, eliminating the need to build individual trunk groups from any one switch to all
5 the other switches in the network until it is economical to do so. Such an individual
6 trunk group would be built only when the volume of calling between any two
7 switches warrants such a direct trunk group connection. By connecting one switch to
8 another using efficient transport (including tandem switching), all customers of those
9 switches can connect with each other.

10 **Q. WHAT IS THE SITUATION TODAY RELATIVE TO LOOPS SERVING**
11 **MASS MARKET CUSTOMERS?**

12 A. The connection between a customer premises and the first point of switching – or the
13 local loop – remains fundamentally a dedicated connection with little opportunity for
14 cost sharing through multiplexing or concentration. The use of digital loop carrier
15 (DLC), which only began to be deployed in the loop plant within the last two
16 decades, provides some opportunity for cost sharing. Depending upon the type and
17 vintage of the DLC, both multiplexing and concentration may occur. However, as I
18 will discuss below, in Sections IV and V, the deployment of DLC in the loop plant
19 creates additional sources of impairment. Loops were originally a simple copper
20 cable pair between the customer’s premise and the local switch, and for the mass

1 market that remains prominently the case today, over 100 years later. The loop plant
2 represents a high fixed cost infrastructure with little opportunity to share costs.

3 This is the very infrastructure the FCC found that incumbents must unbundle because
4 competitors cannot duplicate or replace it. As the FCC explained:

5 No party seriously asserts that competitive LECs are self-deploying copper
6 loops to provide telecommunication services to the mass market.¹¹

7 When the incumbent LECs installed most of their loop plant, they had
8 exclusive franchises and, as such, the record shows that they secured right-of-
9 way at preferential terms and at minimal costs. By contrast, [the] record shows
10 that new entrants have no such advantage.¹²

11 III. ILEC NETWORKS

12 **Q. PLEASE DESCRIBE HOW LOOPS SERVING MASS MARKET**
13 **CUSTOMERS ARE CONNECTED TO THE ILEC’S NETWORK.**

14 **A.** In order to use an analog loop to provision traditional retail local voice service (*i.e.*,
15 POTS), a local exchange carrier must connect that loop to a local circuit switch. The
16 local loop is typically a copper transmission facility that originates at the customer’s
17 premise and terminates on a Main Distribution Frame (“MDF”) in the incumbent
18 LEC’s wire center (see diagram at Exhibit JMB- 2).

19 When an ILEC provides POTS to a retail customer, the customer’s loop must be
20 connected to a port on the ILEC’s switch. The switch port recognizes when a
21 customer wishes to make a call (*i.e.*, goes “off-hook”), indicates to the customer that a

¹¹ TRO at ¶ 226

1 call may be placed (*i.e.*, provides dial tone) and receives the dialed digits necessary to
2 make the call. Similarly, the switch port notifies the customer when someone is
3 calling (initiates ringing for incoming calls). For mass-market customers served by
4 analog voice-grade loops, the switch port connection is generally accomplished using
5 a “jumper” wire pair at the MDF in the ILEC central office. The MDF is a large
6 metal framework that serves the simple purpose of terminating cable pairs in a
7 manner that permits a cable pair on one side of the frame to be connected to a specific
8 piece of central office equipment on the other side of the frame. (See Exhibit JMB-
9 3.) In order to make the connection, an ILEC frame technician runs a pair of wires
10 from one side of the frame to the other in order to make a continuous path between
11 the customer’s loop and the switch port.

12 Individual loops enter the ILEC central office as part of a large cable that collects
13 many loops from a particular neighborhood. The cable typically runs through an
14 underground cable vault and then into the building within a pre-designated
15 infrastructure (cable ducts) to the MDF. The individual loops within the cable are
16 then “fanned out” onto wiring blocks on the “customer facing” side of the MDF.
17 Twisted pairs of insulated wire, commonly referred to as “jumper wires,” are used to
18 cross-connect customer loops, which appear on the customer facing side of the MDF,
19 to wiring blocks on the “network facing” side of the frame. The latter contain the
20 wiring blocks onto which cables from the ILEC’s local switch ports are terminated.
21 Using this technique, customer loops can be assigned to a specific analog switch port

¹² TRO at ¶ 238

1 on the ILEC's circuit switch by placing or repositioning the jumper wire on the MDF.
2 Exhibit JMB-3 depicts a generic MDF cross-connect arrangement.

3 In order to provide POTS service, each customer's individual loop must be connected
4 to an assigned switch port. Currently, the vast majority of end-user loops are serviced
5 by the ILEC, so the vast majority of end-user loops already terminate onto the ILEC's
6 circuit switch by way of the MDF. This is true whether or not service is currently
7 active on the particular loop. When a customer terminates service, *e.g.*, when he or
8 she moves from a location, the ILEC typically does not remove the jumper wires that
9 connect that loop to the ILEC switch. Rather than disrupting the physical connection
10 to the premises, the loop is typically placed in an "inactive" status by software
11 commands issued to the switch's software table. In such cases, no physical work is
12 required to restore full service when a new customer requests it. Instead, the switch
13 software table is merely updated through the use of keystrokes from a computer
14 workstation to show the line is no longer "inactive." This practice of leaving the
15 ILEC loop connected to the ILEC switch port is commonly known in the industry as
16 "dedicated inside plant" and "dedicated outside plant". Other terms for this include
17 "connect through" and "ready access".

18 **Q. OBVIOUSLY THIS ASSOCIATION OF LOOPS AND SWITCH PORTS**
19 **THROUGH THE USE OF FRAME CROSS CONNECTIONS OR JUMPERS**
20 **REPRESENTS AN ECONOMIC AND EFFICIENT METHOD FOR THE**
21 **ILEC; ARE THERE OTHER EFFICIENCIES IN THE ILEC NETWORK?**

1 A. Yes. As discussed above, the evolution of the ILEC loop and switch architecture
2 under monopoly protection has resulted in an effective and efficient arrangement in
3 which both loop and switching costs have been optimized.

4 As a result of the volume of traffic and the resulting economies of scale that the ILEC
5 enjoys, it is able to connect its switches for the completion of inter-switch calls for its
6 customers by an efficient and economical inter-office transport network. The ILEC
7 will engineer this network with direct switch-to-switch trunk groups in all cases
8 where traffic volumes warrant such a connection. In cases where traffic volumes
9 between two switches are not sufficient to justify a direct connection or in cases
10 where there is overflow traffic that cannot be supported by the direct trunk group, the
11 ILEC utilizes an efficient tandem switching and transport network to handle such
12 traffic. This low cost network design allows the ILEC to complete its inter-switch
13 calling using the minimum amount of trunk connections possible to complete a call
14 between two switches. (See Exhibit JMB-4)

15 The ILECs were able to attain the necessary scale because, as the historic monopoly
16 suppliers of all telecommunications services, they could count on serving the entire
17 population located near their switches. ILECs were also able to attain switch scale
18 economies through the use of “host – remote” switching arrangements. A moderate
19 to large size switch in one wire center can “host” smaller “remote” switches (actually
20 modules of the host switch) miles away in other wire centers. Such remote switches
21 are significantly less expensive than stand alone switches of the same line size. In

sum, the ILECs efficiently use their ubiquitous legacy copper loop plant that employs relatively short loops and are able to maintain quality transmission for the analog signals carried over those loops. The ability to use short loops resulted from the monopoly franchise guarantee that there would be significant numbers of end-users within close proximity of a switch, such that the ILECs could attain the scale economies necessary to make their local switches economical.

CLECs, however, cannot benefit from the ILECs' ability to maximize the joint economies of *both* switching and loop facilities. Rather, as described below, CLECs must access the ILECs' loops where they terminate (i.e. in the ILEC's wire centers) and then do their best to survive in an environment in which they are subject to substantial costs and operational impediments not faced by the ILECs.

12 IV. CLEC NETWORKS

13 **Q. HOW DO CLEC NETWORKS DIFFER FROM THE EFFICIENT AND**
14 **ECONOMIC ILEC NETWORK YOU HAVE DESCRIBED?**

15 **A.** In contrast to the incumbents, new entrants do not have the opportunity to achieve
16 scale economies for their switches *and at the same time* minimize loop distances and
17 costs by locating their switches where these loops terminate. The FCC summarized
18 the problem as follows: “The [CLECs’] need to backhaul the circuit . . . effectively
19 requires competitors to deploy much longer loops than the incumbent”.¹³ The FCC’s

¹³ TRO at ¶ 480

1 rules do not permit a CLEC to place a circuit switch in a collocation.¹⁴ And in all
2 events, even if a new entrant were allowed to place a circuit switch in every local
3 serving office, it could not achieve the same scale economies as the ILEC unless it
4 possessed the same market share as the incumbent did in that particular office. This
5 situation is, of course, a practical impossibility. Facing such market uncertainties,
6 CLECs can at best expect to be able to serve only a fraction of the total end-users in
7 any ILEC wire center.

8 Thus, CLECs must deploy individual switches to serve much larger areas than the
9 ILEC, because that is the only way they could possibly achieve switching scale
10 economies comparable to those enjoyed by the ILECs. The FCC recognized this
11 problem in the TRO, noting that “[The RBOCs’ cost studies] suggest that it would be
12 uneconomic for a competing carrier to serve customers in smaller wire centers. All
13 the studies found that in such wire centers, entry would be much more expensive for
14 the competitive LEC than for the incumbent, or simply would be uneconomic”; and
15 “[I]n smaller wire centers, where the competitors’ customer base is likely to be
16 smaller and they are unable to take advantage of scale economies, the cost
17 disadvantage due to backhaul is much larger” .¹⁵

18 Accordingly, CLECs cannot use the same kind of connections, *i.e.*, the MDF jumper
19 wire pairs used by ILECs, to link their customers’ loops to their distant switches.

¹⁴ 47 CFR 51.323 (ILEC may refuse to permit collocation of equipment not necessary for access to UNEs or interconnection).

¹⁵ See TRO at ¶ 484 *see also* TRO at ¶ 480 (citations omitted).

1 Rather, CLECs must deploy an extensive *backhaul network* that extends the existing
2 customer loops – all of which terminate at ILEC wire centers– to a distant CLEC
3 switching location. In Alabama, there are 145 BellSouth wire centers from which
4 CLECs must “backhaul” end-user loops if they want to use their own switching to
5 serve customers in all of the incumbent LECs’ wire centers.

6 **Q. WHAT MUST A CLEC DO IN ORDER TO “BACKHAUL” ITS**
7 **CUSTOMER’S TRAFFIC TO ITS OWN SWITCH?**

8 **A.** In order for a CLEC to “backhaul” its customers’ traffic to its own switch, the CLEC
9 must first create an overlay network infrastructure that is largely dedicated to the
10 subset of customers won from the incumbent in a specific wire center. In essence, the
11 CLEC must add a very long, costly and dedicated “extension cord” in order to
12 connect its end-users’ loops to its switches. This requires the CLEC to:

- 13 (1) establish and maintain collocations at ILEC wire centers, where customers’
14 loops are “collected;”
- 15 (2) install and maintain the equipment necessary to digitize and, using
16 concentration and multiplexing techniques, aggregate the traffic on those
17 loops to permit connections to the CLEC’s switch at acceptable quality levels;
18 and
- 19 (3) establish the necessary transport facilities that provide the physical path
20 connecting the CLEC’s collocations and its switch.

1 Only after all of this infrastructure and these functionalities are in place and
2 operational in each ILEC wire center in which it wishes to compete can a switch-
3 based CLEC begin to offer service to customers in those incumbent's wire centers.
4 Thereafter, for each individual customer line it seeks to serve, the CLEC must then
5 arrange and pay for a manual, volume limited, and costly "hot cut" process to have
6 the customer's loop connection transferred to its collocation, and the customer's
7 telephone number ported to the CLEC's switch.

8 In sum, due to the underlying integrated, and effectively closed, design of the
9 incumbents' local network architecture, competitors must invest in and deploy all of
10 the functionalities described above in order to replace a simple jumper pair across the
11 incumbent's MDF. That is why the FCC correctly found that the barriers CLECs face
12 in attempting to provide a UNE-L based service

13 are *directly associated with incumbent LECs' historical local monopoly*, and
14 thus go beyond the burdens usually associated with competitive entry.
15 Specifically, the *incumbent LECs' networks were designed for use in a*
16 *single carrier, non-competitive environment* and, as a result, the incumbent
17 LEC connection between most voice-grade loops and the incumbent LEC
18 switch consists of a pair of wires that is generally only a few feet long and
19 hardwired to the incumbent LEC switch.¹⁶ (Emphasis added)

20 These barriers generate very significant costs for the CLECs, costs that ILECs do not
21 incur. This, in turn, makes it impractical and uneconomic even for "efficient"
22 competitors to provide service *via* UNE-L to the low volume (and low margin¹⁷)
23 communications users typically found in the mass-market.

¹⁶ TRO at ¶ 465 (emphasis added) (citations omitted).

¹⁷ TRO at ¶ 474 (the mass market is "characterized by low margins").

1 The following subsections describe in greater detail the general infrastructure and
2 equipment that a CLEC must install and operate in order to provide service to mass
3 market customers using analog voice grade loops (*i.e.*, collocation, collocation
4 equipment, transport, and hot-cuts).

5 **A. Collocation**

6 **Q. WHAT IS THE FUNCTION OF A COLLOCATION AND WHY ARE THEY**
7 **PROBLEMATIC?**

8 A. A CLEC cannot provide any telecommunications service employing a UNE-L
9 architecture until the retail customer is physically connected to its network switch. In
10 order to provide POTS service, as explained above, a CLEC must deploy the
11 equipment required to digitize, encode, multiplex and concentrate its customers'
12 traffic so that the unbundled loops terminating in the ILEC's wire center can be
13 extended to the CLEC's switch. In order to do so, *i.e.*, to make an ILEC loop useable
14 at a CLEC switch, the CLEC must rent space to establish a collocation in the ILEC's
15 wire center. (See Exhibit JMB-5)

16 Establishing a collocation involves a number of activities and costs that will vary
17 depending on the type of collocation established. The ILECs offer various
18 collocation arrangements including physical collocation in which the CLECs
19 equipment can either be secured in a "caged" space or unsecured in a "cageless":
20 space and virtual collocation in which the CLEC's equipment is leased to the ILEC
21 and is installed and maintained by the ILEC on the CLEC's behalf.

1 In general, the activities required to establish a collocation include: (1) obtaining the
2 necessary space in the wire center, which is predicated upon the ILEC having
3 sufficient collocation space in its central office;¹⁸ (2) engineering the collocation; (3)
4 arranging construction (for physical caged collocations); (4) cabling the CLEC
5 interface frames for its collocated equipment to cross-connection frames in the
6 incumbent's space and (5) installing the required equipment in the collocated space.

7 Because the CLEC's equipment in the collocated space requires electric power, the
8 CLEC must also pay the incumbent for delivery of direct current ("DC") power and
9 emergency power to operate the collocated equipment. In some instances, the CLEC
10 may opt to invest in additional equipment to deploy power distribution, i.e., a battery
11 distribution fuse bay ("BDFB") within its own collocation to provide for more
12 flexibility and to minimize the need for a subsequent (and generally very costly)
13 power augment. In general terms, the collocation power charges are driven by the
14 charges for redundant power feeds (sized for the maximum demand in the
15 collocation) and the necessary HVAC for the collocated equipment.

16 A CLEC's collocation costs can be highly influenced by the incumbent's minimum
17 requirements for collocation purchases. For example, while a CLEC may only
18 require 25 square feet of floor space for its equipment in a given LSO, the ILEC may
19 have a minimum size for caged collocation of 50 or 100 square feet. Similarly, while
20 the CLEC's equipment may only require 40 amps of power the ILEC may have a

¹⁸ See TRO, at ¶ 477

1 minimum power feed requirement of 60 DC amps and/or the power may be billed
2 based on fused rather than drawn power.

3 Such minimum space/power requirements serve to needlessly inflate a CLEC's
4 collocation expenses, particularly for locations where the CLEC may only win a
5 small quantity of lines. Accordingly, the average cost of collocation under such
6 conditions may become prohibitive, because the equipment deployed actually
7 requires substantially less space and/or power than the minimum space required or
8 power charged for by the ILEC. Similarly, the incumbent sometimes applies large
9 up-front one-time charges for the collocation application, cage engineering (whether
10 for space or power) or administrative fees (such as project management, space
11 availability reports, etc.), which may prove unrecoverable depending upon the market
12 share achieved in the specific area served by the collocation facility.

13 As discussed in the testimony of Steven E. Turner, the unit collocation costs for an
14 efficient CLEC seeking to serve the mass market in Alabama are significant.

15 **B. Collocation Electronics**

16 **Q. CAN YOU DESCRIBE THE KEY ELECTRONIC COMPONENTS**
17 **NECESSARY?**

18 A. Yes. Obviously having an empty collocation space does not by itself provide the
19 CLEC with any of the functionality necessary to connect customers on ILEC loops to
20 the CLEC's switch. Additional equipment is necessary to make the loop connection

1 work. (See Exhibit JMB-6) For example, analog voice signals degrade and
2 unwanted noise increases as the length of a copper facility increases. Thus, the longer
3 a copper loop, the less a voice signal can be distinguished from noise on the line.
4 This is known as “signal loss”. The incumbent’s loop plant is designed so that voice
5 grade loops consume all but a “safety margin” of the allowable signal loss on the
6 conductor. Therefore, once the analog loop is delivered to the CLEC collocation
7 cage, the analog telecommunication signals on the loop cannot travel much farther
8 and still retain acceptable voice and analog modem quality levels.

9 Accordingly, in order for a CLEC’s mass-market customers’ communications to
10 transit back and forth between the customer’s premises and the CLEC’s remotely
11 located switch at an acceptable level of quality, the CLEC must install digital loop
12 carrier (“DLC”) transmission equipment. While this DLC equipment is absolutely
13 mandatory for the CLEC, it is not required for the ILEC when serving the same
14 customers.

15 The CLEC’s DLC equipment must be placed in the collocation arrangement that is
16 located in the wire center where the end-user loops terminate. The equipment
17 digitizes, encodes, concentrates and multiplexes the analog signals received from the
18 customer so that the CLEC can extend the loop signal back to its remote switch in a
19 manner that (1) provides service quality that will meet customer expectations and (2)
20 minimizes the CLEC’s costs to transport its customers’ traffic back and forth from its
21 switch. This equipment includes the cross-connection frame (also known as a POTS

1 bay) between the incumbent's MDF where the loops terminate and the DLC
2 equipment, the DLC equipment itself, and high capacity digital cross-connection
3 frames ("DSX-1" or "DSX-3") necessary to cross-connect the digital output from the
4 DLC to the transmission facilities that ultimately connect to the CLEC's remotely
5 located switch. In addition, test access and monitoring equipment must be deployed
6 in the collocation to allow the CLEC to operate its equipment as efficiently as
7 possible.

8 As noted above, the CLEC DLC equipment, which is not required in the ILEC's
9 network, receives the analog communications from the loop and digitizes,
10 concentrates and multiplexes the communications on the CLEC customers' loops so
11 that the connecting transport facility can be used efficiently. The DLC also
12 interoperates with the CLEC's switch to provide and receive the signaling necessary
13 for call supervision, including the provision of dial tone and ringing current, digit
14 reception and related functions. Thus, when using this architecture arrangement, the
15 DLC equipment is not only needed to extend the CLEC's loops, it is also essential to
16 provide electrical current for the ringing and dial-tone necessary for POTS service,
17 functions that are performed by the ILEC's switch port as described in Section III
18 above.

19 Additional equipment is needed to take the output of the DLC and place it on
20 transport facilities for transmission out of the retail customer's wire center. The
21 digital cross connection frame (or DSX equipment) provides for this functionality by

1 permitting the DLC to be efficiently cross-connected to the backhaul transport
2 facility. DSX-1 equipment allows for connections to DS-1 transport facilities. DSX-
3 3 equipment allows for connections at the DS-3 level. The volume of traffic that will
4 be served from the wire center dictates the type of equipment used at a particular
5 location. As described in greater detail in the Transport section below, when
6 transport is leased from the incumbent, the DSX equipment cross-connects DLC
7 transmissions from the CLEC's collocation to the ILEC's transport facilities. In cases
8 where the CLEC provides its own transport to its switches, connections from the DLC
9 are typically to an optical multiplexer which, in turn, is connected to the CLEC's
10 metropolitan fiber ring. (See Exhibit JMB-7)

11 **Q. CAN DLC EQUIPMENT AND DSX EQUIPMENT BE INSTALLED IN A**
12 **MANNER THAT GROWS SMOOTHLY WITH THE GROWTH OF CLEC**
13 **CUSTOMERS IN AN AREA SERVED FROM A COLLOCATION?**

14 **A.** No. DLC equipment is not designed to, and therefore cannot, scale precisely with the
15 level of demand (or number of lines) served in a wire center. Rather, there is a
16 minimum amount of DLC equipment that must be purchased and installed.
17 Accordingly, DLC investment is very "lumpy". The first module of collocated DLC
18 typically includes equipment that manages the interface with both the transmission
19 facility and the sub-modules of DLC equipment where the lines physically terminate.

20 For example, common equipment in the LiteSpan 2000 product, manufactured by
21 Alcatel, can serve up to 2,016 POTS lines. Additional equipment, which is frequently

1 referred to as a channel bank assembly, manages the interface between the analog
2 lines and the digital switch port and provides for the sharing (concentration of lines)
3 of the transmission facility. The channel bank assembly for the LiteSpan 2000
4 product handles up to 224 POTS lines. Finally, individual POTS lines terminate on
5 electronic devices called line cards. Line cards terminate the loop and provide the
6 electrical interface to the DLC channel bank assembly. For the LiteSpan 2000
7 product, 4 POTS lines can terminate on a single line card. In the LiteSpan example,
8 in order to serve a single POTS line, a CLEC would need one line card capable of
9 serving up to four lines, one channel bank assembly capable of serving up to 224 lines
10 and one DLC common unit capable of serving up to 2,016 lines. No additional
11 investment would be needed until the fifth line is served, when a second line card
12 would be required. A new channel bank would be required when the 225th line is
13 added, and when the 10th channel bank assembly is required (*i.e.*, when the 2,017th
14 line is added) the whole process would start again with new common unit, a new
15 channel bank assembly and a new line card.

16 Additionally, because the many collocated DLCs that subtend a CLEC's switch are so
17 widely dispersed over a large geographic area, it is uneconomic to incur the travel
18 expense to add small increments of equipment. Accordingly, CLECs are forced in
19 practice to install extra capacity rather than dispatch a technician each time a new line
20 card or channel bank assembly is needed. Thus, the CLEC must install an inordinate
21 amount of spare equipment and suffer a sub-optimal equipment utilization rate.

1 The digital cross connection frame (whether a DSX-1 or DSX-3) takes the output of
2 the DLC as a digital electrical signal and connects it to either a DS1 or a DS3
3 transport facility that extends the loops from the CLEC's collocation to the CLEC
4 switch. DSX equipment is also not designed to scale smoothly with growth. A
5 typical DSX 3 panel can terminate 24 DS-3 transport circuits. Each DS-3 is
6 equivalent to 672 DS-0 (voice grade) channels, and DLCs typically permit 4 lines to
7 share a single channel through the unit's concentration capabilities. A single DSX-3
8 panel when used in conjunction with DLCs, therefore, has capacity to handle more
9 than 64,000 ($24 \times 672 \times 4 = 64,512$) POTS lines – approximately the equivalent
10 capacity of a large incumbent LEC wire center.

11 **C. Transport**

12 **Q. PLEASE DESCRIBE HOW THE TRANSPORT FUNCTION IS**
13 **ACCOMPLISHED.**

14 A. What I have described so far brings the loop into the collocation space and prepares it
15 to be extended, along with numerous other loops, to the CLEC's distant switch. Once
16 a CLEC customers' signals have been prepared for transport to the CLEC switch, the
17 CLEC must arrange for transmission capability to deliver traffic from the collocation
18 to its remotely located switch. Here again, this transport requirement does not exist in
19 the ILEC's network.

20 In some cases, a CLEC's collocation will be connected to another collocation through
21 the purchase of ILEC transport facilities (*e.g.*, DS1 and DS3 capacity facilities) as the

1 CLEC traffic volumes at most incumbent wire centers are typically too low to justify
2 CLEC construction and use of owned transport facilities. (See Exhibit JMB-8) When
3 used, this second CLEC collocation typically serves as a “hub” location to aggregate
4 loops from several sub-tending collocations in the area and subsequently transport the
5 loops to the CLEC’s switching location, either over higher capacity leased facilities
6 or using self-provided CLEC transport. The FCC commented on this type of
7 arrangement in the TRO: “Competing carriers generally use interoffice transport as a
8 means to aggregate end-user traffic to achieve economies of scale. They do so by
9 using dedicated transport to carry traffic from their end users’ loops, often
10 terminating at incumbent LEC central offices, through other central offices to a point
11 of aggregation.”¹⁹

12 Self-provided transport between ILEC wire centers is the exception rather than the
13 rule for mass-market service. Indeed, POTS volumes from a single wire center alone
14 could not justify a CLEC’s deployment of its own transmission facility. This is
15 corroborated by the FCC’s finding of national impairment when a CLEC requires 12
16 or fewer DS3s of capacity.²⁰ Twelve DS3s are equivalent to 32,256 POTS lines, with
17 a four-to-one DLC concentration ratio. However, the average sized ILEC wire center
18 has under 15,000 POTS lines.

¹⁹ See TRO at ¶ 361. See also TRO at ¶ 370.

²⁰ TRO at ¶ 388.

1 In other cases, rather than linking two collocations together, single collocations will
2 be equipped to extend the loops collected directly to the CLEC's switch location.
3 (See Exhibit JMB-5.)

4 In either case, regardless of which carrier provides it, a CLEC must procure transport
5 facilities between its collocations and switching locations in order to backhaul
6 customers' loops to its switch. Ironically, when the transmission capability is
7 procured from the ILEC rather than self-provisioned, the CLEC's transport cost has
8 potentially increased as a result of the TRO. In the TRO, the FCC determined for the
9 first time that ILECs are no longer required to unbundle transport facilities for
10 requesting CLECs when such facilities are used to backhaul traffic from the CLEC
11 end user loops to their switches.²¹ As a result, CLECs may now be required to pay
12 above cost special access rates to ILECs for such transport.

13 **D. Physical Transfer Of Loops**

14 **Q. ONCE THE CLEC HAS PURCHASED, INSTALLED AND ACTIVATED ALL**
15 **OF THE COLLOCATION SPACE, EQUIPMENT ELEMENTS AND**
16 **TRANSPORT ARRANGEMENTS, WHAT ELSE MUST OCCUR FOR**
17 **CLECS TO PROVIDE SERVICE TO CUSTOMERS USING UNE-L LOOPS?**

18 A. Once the necessary network infrastructure described above is in place, the CLEC is
19 finally in a position to transfer individual customer loops from the incumbent's
20 network to its collocation and ultimately to its switch. In order to accomplish this, the

²¹ TRO, at ¶¶ 365-369.

1 CLEC must arrange for what is typically referred to as a hot cut. The hot-cut process,
2 which is described in detail in the testimony of Mark Van de Water, involves multiple
3 manual steps and coordinated activities of both CLEC and ILEC personnel.

4 These include, among other things: (1) interrupting the customer's service while
5 changing the customer's loop cross-connection at the MDF from a terminal pair
6 connected to the incumbent's switch port to a terminal pair that connects to a pair of
7 terminals in the CLEC collocation and (2) coordinating the porting of the customer's
8 telephone number to the CLEC's switch so that calls dialed to the customer's number
9 can be properly completed. Once the hot-cut has been successfully completed, a
10 CLEC can finally provide service to its end-user using its own switch. In contrast, as
11 discussed above, the ILEC can provide service to that same customer on the same
12 loop through a software change command. Because of all of the physical work and
13 manual touch points and the associated human error involved with a hot cut, the
14 process is inadequate to service mass market customers.

15 As the FCC noted, the shortcomings of the hot cut process also stem from the ILECs
16 legacy network created for a monopoly environment:

17 The barriers associated with the manual hot cut process are directly associated
18 with incumbent LECs' historical local monopoly, and thus go beyond the
19 burdens usually associated with competitive entry. Specifically, the
20 incumbent LECs' networks were designed for use in a single carrier, non-
21 competitive environment and, as a result, the incumbent LEC connection
22 between most voice-grade loops and the incumbent LEC switch consists of a
23 pair of wires that is generally only a few feet long and hardwired to the
24 incumbent LEC switch. Accordingly, for the incumbent, connecting or
25 disconnecting a customer is generally merely a matter of a software change.
26 In contrast, a competitive carrier must overcome the operational and economic
27 barriers associated with manual hot cuts. Our finding concerning operational
28 and economic barriers associated with loop access reflects these significant

1 differences between how the incumbent LEC provides service and how
2 competitive LECs provide service using their own or third-party switches.²²

3 **E. Issues of Scale**

4 **Q. DO ALL OF THE ADDITIONAL SPACE, EQUIPMENT AND FACILITIES**
5 **YOU HAVE BEEN DESCRIBING THAT ARE NOT REQUIRED IN THE**
6 **ILEC'S NETWORK ADD SIGNIFICANT COSTS TO THE CLEC**
7 **NETWORK?**

8 A. Yes. Each of the collocation and backhaul costs that a CLEC must incur to connect a
9 customer's ILEC loop to the CLEC's remote switch is a cost that the ILEC does not
10 incur to serve the same customer, because the ILEC's switch is located in the same
11 wire center where its customers' loops terminate. The CLEC's cost disadvantage,
12 however, is multiplied because the ILEC also significantly benefits from what
13 economists might describe as "first mover advantages" that translate into scale
14 advantages.

15 Because of its status as the incumbent, monopoly provider, the ILEC starts with all
16 the customers in a wire center, and each of them are already served by its switch and
17 generating revenue. Thus, the ILEC does not have to expend resources attempting to
18 persuade customers to change carriers in order to acquire their business and revenues.
19 Unlike competitive carriers, the ILEC does not need to "acquire" large numbers of
20 customers. It only needs to hold its existing customers while offering attractive win-
21 back offers to entice customers who left for a competitor to return.

²² TRO at ¶ 465 (citations omitted).

1 These scale or share disadvantages multiply the backhaul cost disadvantage described
2 above. Switches are expensive, fixed cost investments and are thus subject to
3 substantial economies of scale. Put simply, switches must be filled with the lines and
4 traffic of paying customers in order to generate the revenues needed to recover the
5 cost of these high fixed-cost investments. However, in order for a CLEC to achieve
6 the same switch scale economies that an ILEC achieves for a single switch at a single
7 wire center, that CLEC must aggregate substantial quantities of loops from multiple
8 central offices and bring the traffic from each of them back to its own switch. To do
9 so, it must build and pay for multiple collocation and “backhaul” arrangements in
10 order to achieve the same scale efficiencies that the ILEC achieves at a single
11 location.

12 For example, assume an ILEC has 40,000 mass market voice grade lines terminating
13 in its wire center and a switch in that wire center with the capacity to handle the
14 quantity of traffic generated by these lines. Assume, also, the ILEC will likely retain
15 80% of the customer lines while the CLEC community splits the remaining 20%. If a
16 CLEC expected to serve 10% of the lines out of that wire center (or 50% of the
17 aggregate CLEC market share), the CLEC would expect to serve 4,000 customer lines
18 out of the wire center while the ILEC would have the traffic and revenues from
19 32,000 lines to fill its switch and recover its costs.

20 In order for the CLEC to achieve the same 32,000 mass market lines on its (distantly
21 located) switch, it would have to aggregate a similar percentage of the analog lines

1 from approximately 8 ILEC central offices of equal size. (Alternatively, the CLEC
2 would have to fill its switch by accessing loops from a larger number of smaller ILEC
3 wire centers resulting in further increased backhaul costs.) To achieve this degree of
4 switch usage (32,000 lines), the CLEC would need to have 8 collocations and 8
5 backhaul arrangements, all just to have the same switch scale economies as the ILEC
6 in one single wire center.

7 Exhibit JMB-9 provides an overview of the CLEC network architecture required to
8 collect and extend customer's loops from the ILEC wire center to the CLEC switch.
9 The contrast with what is required for the ILEC to perform the same function, shown
10 in Exhibits JMB-2 and JMB-3, cross connect a loop to a switch port using a jumper
11 on the MDF, is clear.

12 **V. IMPACT OF ENHANCED LOOP TECHNOLOGY DEPLOYMENT AND**
13 **CALL TERMINATION**

14 **Q. ARE THERE ADDITIONAL IMPAIRMENTS THAT RESULT FROM THE**
15 **ILECS DEPLOYMENT OF ENHANCED LOOP TECHNOLOGY?**

16 **A.** Yes. CLECs are further impaired in offering service to mass market customers
17 because the incumbent has placed a large and growing portion of these customers'
18 loops on integrated DLC ("IDLC") equipment. As described in the testimony of
19 Mark Van de Water, IDLC loop arrangements, where alternative spare capacity is not
20 available, can practically foreclose CLEC access to the retail customer.

1 Increased deployment of IDLC can significantly limit CLECs' ability to provide
2 competing service if they are denied access to UNE-P. This is so because the IDLC
3 equipment multiplexes multiple customers' traffic onto a single loop "feeder" facility
4 that feeds directly into the ILEC's switch, and there is no simple way to segregate (or
5 access) the traffic of a particular customer served with an IDLC loop. As a result,
6 additional steps must be taken to segregate and access the traffic of a customer that
7 desires to take service from a CLEC.

8 The steps required are dependent upon a number of factors within the LEC's control,
9 including the accuracy of its records (as to which loops are served by IDLC) and the
10 existence of spare loop plant of the appropriate type in the ILEC's network that would
11 allow a competitor to provide a comparable level of service to the ILEC's service.
12 For example, if the ILEC's database does not reveal the presence of IDLC before a
13 conversion date is committed to the customer, the CLEC must negotiate a new date
14 with that customer, which of course makes a negative impression.

15 Where the presence of IDLC is identified before the confirmation of the conversion
16 date, the customer must be transferred to alternative facilities, provided such facilities
17 are available and provided acceptable service quality is possible. But even then, the
18 process to transfer the customer will require a field dispatch to the remote end of the
19 IDLC facility so that the customer's loop may be re-wired to spare copper or UDLC
20 facilities. In cases where acceptable spare loop plant is not available, other customers
21 who are not otherwise involved in the hot cut may be affected. In these cases the

1 ILEC might “swap-out” a retail customer’s non-IDLC loop facilities with the IDLC
2 facilities of the customer who wishes to change his/her local service provider.
3 Overall, the process to accommodate access to IDLC loops is resource intensive,
4 costly, customer affecting and difficult to coordinate, even when compared to the
5 “ordinary” hot cut process. Additionally, as competition increases, the CLECs may
6 find situations where the ILEC has neither spare facilities nor retail customers with
7 non-IDLC facilities that can be used for a swap-out. In these cases the CLEC will be
8 precluded from offering a competitive choice to these customers.

9 Additionally, except when the IDLC served customer can be placed on a copper loop
10 less than 18,000 feet in length, CLECs are denied the capability of providing DSL
11 services to their customers. In contrast, BellSouth can provide its retail DSL service,
12 known as FastAccess, to the vast majority of its customers in Alabama despite loop
13 lengths that preclude CLEC DSL service. While I do not have data specific to
14 Alabama, I know that in Florida and Georgia FastAccess is available to over 86% of
15 BellSouth’s customers.

16 **Q. IN SECTION III ABOVE YOU DISCUSSED THE EFFICIENT AND**
17 **ECONOMIC NETWORK AVAILABLE TO ILECS, AND CLECS USING**
18 **UNE-P, TO TERMINATE CALLS. DO CLECS FORCED TO USE UNE-L**
19 **HAVE ACCESS TO THE SAME EFFICIENCIES AND ECONOMIES?**

20 **A.** No. CLECs will also be impaired when trying to serve the mass market with
21 unbundled loops by an inability to exchange traffic with the ILEC at a switch-to-

1 switch level. As explained earlier, because the CLEC does not have the economies of
2 scale to direct connect its switch with efficient inter-office trunk groups to each of the
3 ILEC's local switches, the CLEC will be more reliant on the ILEC's tandem network
4 for the exchange of traffic. This reliance will put the CLECs at a cost disadvantage
5 because of the additional tandem switching costs and transport facilities that will be
6 needed to complete each of its calls. Additionally, because the CLEC will route a
7 large percentage of its traffic to the ILEC's tandem switch it will face the potential for
8 greater call blocking as a result of tandem congestion and/or inadequate subtending
9 trunking from the ILEC's tandems to its end offices. (See Exhibit JMB-10)

10 **VI. CONCLUSION**

11 **Q. HOW HAS THE MONOPOLISTIC HISTORY OF THE ILEC IMPACTED**
12 **THE EVOLUTION OF THE LOCAL NETWORK OVER THE LONG RUN**
13 **AND IN THE YEARS SINCE THE PASSAGE OF THE**
14 **TELECOMMUNICATIONS ACT OF 1996 (“the ACT”)?**

15 **A.** Incumbent LEC networks were designed in a manner that enables them -- and no one
16 else -- to maximize the efficiencies of both their loop and switching assets. This
17 design provides them with substantially higher quality and lower costs compared to
18 their potential competitors. Specifically, ILECs can connect their analog voice grade
19 loops to their switches by using a simple jumper wire pair across the MDF in the
20 customer's local serving office. ILECs were able to construct this type of network

1 architecture because, as the historic monopolists, they supplied local
2 telecommunications to all customers in their serving areas.

3 Until the passage of the Act in 1996, the network evolved for the exclusive use of a
4 single user, the ILEC. Since the passage of the Act, the ILECs have resisted opening
5 that network for use by their competitors, doing so only when and as specifically
6 ordered by the FCC and various states.

7 **Q. BECAUSE OF THE SINGLE USER NATURE OF THE ILEC'S NETWORK,**
8 **WHAT ARE THE BARRIERS FACING CLECS WANTING TO USE THE**
9 **LOOPS IN THAT NETWORK TO PROVIDE LOCAL SERVICE USING**
10 **THEIR OWN SWITCHES?**

11 **A.** CLECs cannot maximize the combined efficiencies of both the ILEC loop plant and
12 their own network infrastructure. Rather, in order to compete, they must take the
13 ILEC loop plant as it exists and extend all of their customers' loops to their own
14 switches, which are typically located a significant distance from the customer's
15 serving office, a network architecture that is expensive and necessary. Accordingly,
16 before a CLEC can provide POTS service using its own switch and ILEC analog
17 voice grade loops, it must:

18 (1) engineer, establish and maintain a collocation, including the associated
19 HVAC and power;

1 (2) install and maintain digitization, concentration, and multiplexing
2 equipment at its collocations, as well as related monitoring/testing and power
3 distribution equipment; and

4 (3) arrange for and provide transport between its collocation and its switch.

5 Each of these activities imposes additional costs and operational barriers on CLECs,
6 costs that ILECs do not incur to offer the same service. As noted above and
7 demonstrated in the testimony of Steven E. Turner, the additional cost per line in
8 Alabama that such activities impose on CLECs represents significant, real costs not
9 faced by incumbents that effectively foreclose CLECs from serving mass-market
10 customers through the use of their own switches.

11 **Q. GIVEN THE SIGNIFICANT BARRIERS FACING CLECS DESIRING TO**
12 **ENTER THE LOCAL MARKET USING UNE-L, HOW HAS COMPETITION**
13 **FOR MASS MARKET CUSTOMERS ACTUALLY DEVELOPED IN THE**
14 **SEVEN YEARS SINCE THE PASSAGE OF THE ACT?**

15 **A.** A number of CLECs did attempt to enter the market using UNE-L. Most are now in
16 bankruptcy, and those who are not serve only business customers. A number of other
17 CLECs attempted to enter the market using total services resale ("TSR"). TSR
18 quickly proved to be financially untenable except as a niche product to serve groups
19 of customers on a pre-paid basis that could not otherwise obtain local service.

20 After a delayed start, caused by ILEC regulatory opposition at the state level, UNE-P
21 has emerged as the entry method capable of and actually bringing competition to the

1 mass market. As Mr. Joseph Gillan notes in his testimony for CompSouth, UNE-P
2 works, and furthermore, benefits not only CLECs, but also the ILECs, and most
3 importantly, the consumer, when compared to forced use of UNE-L.

4 UNE-P is an electronic service provisioning system that extends to the CLECs many
5 of the same efficiencies and economies available in the ILEC network. UNE-L is not
6 and cannot be made so through the implementation of “batch” hot cut processes and a
7 pairing with “rolling access” neither of which, individually or collectively, eliminates
8 any of the fundamental characteristics of the existing single user ILEC network.

9 **Q. CAN THE FUNDAMENTAL CHARACTERISTICS OF THE EXISTING**
10 **SINGLE USE ILEC NETWORK BE MITIGATED WITHOUT**
11 **TECHNOLOGICAL CHANGE?**

12 A. No. Until the underlying local network architecture that has created these
13 impairments is changed, CLECs will continue to face significant practical and
14 economic impairments in serving mass market end-users on ILEC loops *via* their own
15 switches—impairments that make UNE-P the only viable entry method for serving
16 the mass market.

17 **Q. CAN THE FUNDAMENTAL CHARACTERISTICS OF ACCESS TO LOOPS**
18 **BE CHANGED IN A MANNER THAT BENEFITS CONSUMERS BY**
19 **EXPANDING THE DEVELOPMENT OF MASS MARKET COMPETITION?**

1 **A.** Yes. There is a means available that uses currently available technology and allows
2 the provisioning of loops to be operationally and competitively neutral, making it the
3 local service counterpart of “equal access” in the long distance market. This is a
4 process that AT&T has generically referred to as “electronic loop provisioning”
5 (“ELP”). Exhibit MDV-4, attached to the testimony of Mark Van de Water, is a
6 videotape that concludes with an overview and demonstration of ELP and is directly
7 related to my testimony here.

8 As discussed in Section IV above, the underlying single user local network
9 architecture and technology that ILECs deployed over the decades, and have resisted
10 changing since the passage of the Act, impose on CLECs the burdens of a vast
11 investment in backhaul infrastructure (e.g., collocation, collocation electronics, and
12 transport facilities) and of an inefficient and costly loop migration process (*e.g.*, hot
13 cuts) that ILECs do not have to incur in order to serve end-users. The “batch” hot cut
14 process and use of UNE-P based “rolling access” do not erase any of these problems
15 that make the use of UNE-L for the mass market infeasible. Change is required and
16 possible and, in fact, many of the components necessary to make the change are
17 already in use in the ILEC network.

18 Competitively neutral, efficient access to customer loops is required for mass-market
19 competition to develop and be sustainable in a UNE-L environment. This means that
20 customer transfers among competing networks must be fast, inexpensive and non-
21 disruptive for the customer choosing a CLEC as its carrier. No carrier should be

1 advantaged or disadvantaged with regard to how customers are physically connected
2 to competing networks. The ILECs' current network was designed to accommodate a
3 single firm operating as a monopoly. It cannot functionally support a competitive,
4 multi-carrier environment without significant modification. Fortunately, however,
5 modern technology has opened new opportunities for responsibly converting the
6 ILEC network into an efficient multi-carrier network.

7 The characteristics of such a network are fairly easy to define. Loops should be
8 readily accessible at a few centralized locations, and the interface to the loops should
9 be electronic, as it is today in the ILECs' network and when UNE-P is used.
10 Centralized availability of digital, packetized customer signals (rather than dispersed
11 access to physical, analog loops) would address and resolve many of the problems.
12 First, transmitting voice signals in a digital and packet format eliminates the need for
13 CLECs, and only CLECs, to deploy costly electronics that do not augment the types
14 of services that may be deployed. Centralized access, highly feasible with a packet-
15 based network infrastructure, can significantly reduce the need for, and the cost of,
16 collocation. Equally important, packetized signals are readily redirected by software
17 commands. This feature offers the speed, cost structure, capacity and ease of change
18 fundamental to unconstrained competition. It removes the manual hot cut process
19 from consideration and replaces it with electronic provisioning that is equal to that
20 which exists for UNE-P and in the long distance marketplace. Lastly, a packet-based
21 loop architecture would eliminate the need for competitors to adopt a circuit-switched

1 infrastructure and permit the introduction of new services that leverage the computer
2 controlled and higher bandwidth features of a packet-based network.

3 The technology and equipment necessary to realize non-discriminatory digital,
4 centralized and packet-based loops are available today. Indeed, the digitization and
5 packetization of voice communications can be seen as a logical extension of
6 equipment and technology already in use by the ILECs in association with their
7 deployment of DSL. The three major components necessary to support the necessary
8 changes are already in service, Next Generation Digital Loop Carriers (“NGDLC”),
9 Asynchronous Transmission Mode (“ATM”) modules, and ATM-compatible
10 equipment known as “voice gateways” or “VoATM Gateways”.

11 **Q. PLEASE SUMMARIZE THE CRITICAL ISSUE YOU DISCUSS IN YOUR**
12 **TESTIMONY.**

13 A. The critical issue of this proceeding is not whether CLECs can “deploy” their own
14 switches. Instead, the critical issue upon which this Commission should focus is
15 whether a CLEC can “efficiently use” its own switch to connect to the local loops of
16 end users. The differences in the way end users’ loops are connected to carriers’
17 switches are among the most important factors that cause CLECs to face substantial
18 operational and economic entry barrier when they seek to offer POTS to mass-market
19 (residential and small business) customers using their own switches and ILEC-
20 provided loops (i.e., UNE-L facilities-based entry). Without fundamental changes to
21 the way in which the ILECs permit CLECs to gain access to the consumers’ loops,

1 the impairment found by the FCC will continue.

2 **Q. DOES THIS CONCLUDE YOUR TESTIMONY?**

3 **A. Yes, at this time.**